

HANDSHAKE PROBLEM

Fifteen people are at a party. If each person shakes hands with everyone else (JUST ONCE), how many handshakes are there in all?

Handshake Anticipated Student Thinking
Correct Answer = 105

① $15 \times 14 = 210$ ② $15 \times 15 = 225$



$14 + 14 + 14 \dots + 14 = 210$

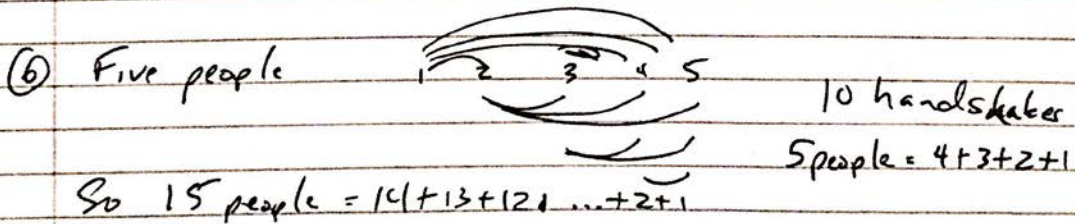
OR

$14 + 13 + 12 + 11 + \dots + 2 + 1 = 105$

④

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	14
2	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	13
3	X	X	X	.	.	.	.	.	.	.	.	.	.	.	.	12
4	X	X	X	X	.	.	.	.	.	.	.	.	.	.	.	11
5	X	X	X	X	X	.	.	.	.	.	.	.	.	.	.	10
6	X	X	X	X	X	X	.	.	.	.	.	.	.	.	.	9
7	X	X	X	X	X	X	X	.	.	.	.	.	.	.	.	8
8	X	X	X	X	X	X	X	X	.	.	.	.	.	.	.	7
9	X	X	X	X	X	X	X	X	X	.	.	.	.	.	.	6
10	X	X	X	X	X	X	X	X	X	X	.	.	.	.	.	5
11	X	X	X	X	X	X	X	X	X	X	X	.	.	.	.	4
12	X	X	X	X	X	X	X	X	X	X	X	X	.	.	.	3
13	X	X	X	X	X	X	X	X	X	X	X	X	X	.	.	2
14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	.	1
15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0
																105

⑤ $210 \div 2 = 105$



BARREL PROBLEM

Two barrels contain equal quantities of honey. From one barrel, 37 gallons of honey are drawn. From the other barrel, 7 gallons of honey are drawn. The quantity remaining in one barrel is now seven times that remaining in the other barrel. How much did each barrel contain at first?

The handwritten solution shows three stages of the barrels:

- Stage 1:** Two barrels, A and B, both containing 37 gallons. Barrel A is labeled "-37gal" and Barrel B is labeled "-7gal".
- Stage 2:** After drawing honey, Barrel A contains 7 gallons and Barrel B contains 30 gallons. The 7 gallons in A and 30 gallons in B are circled. A note says "7x" with an arrow pointing to the 7 in A, and "30 circled but is 6x the amount missing in other circled amount".
- Stage 3:** The final state where Barrel A contains 5 gallons and Barrel B contains 35 gallons.

Next to the diagrams are the equations:

$$30 = 6x$$

$$5 = x$$

At the bottom, it says "or trial & error".

BIG JIM/LITTLE JIM PROBLEM

When Big Jim stands on a bench that is 15 inches high, the top of his head is 53 inches above the top of Little Jim's head. Big Jim's height is twice that of Little Jim's height. How tall is Big Jim? How tall is Little Jim?

The handwritten solution includes two diagrams:

- Diagram 1:** Shows Big Jim (BJ) standing on a 15-inch high bench. Little Jim (LJ) stands next to him. The top of BJ's head is 53 inches above the top of LJ's head.
- Diagram 2:** Shows the height difference between the two heads as $53 - 15 = 38$ inches.

Next to the diagrams are the equations:

$$BJ = 2LJ$$

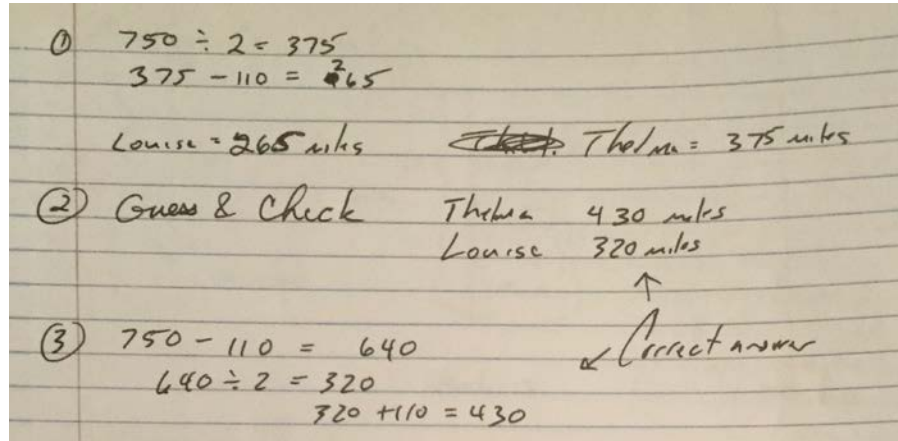
$$38 \cdot 2 = 76 \text{ in } BJ$$

$$38 \text{ in } LJ$$

At the bottom, it says "or trial & error".

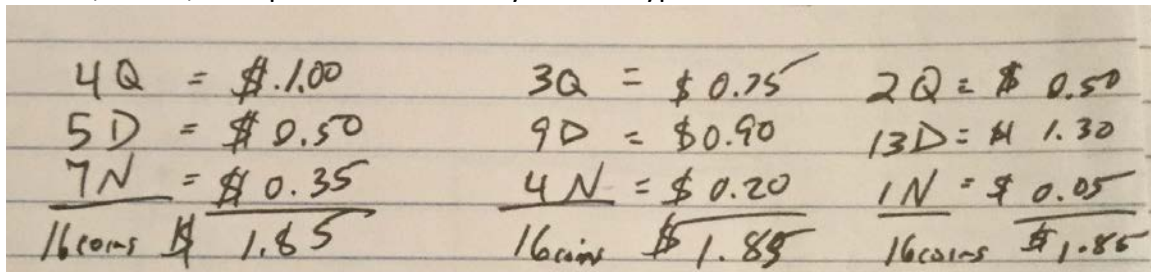
THELMA AND LOUISE

On a 750 mile road trip Thelma drove 110 miles more than Louise. How far did each person drive?



ALLOWANCE PROBLEM

Mark gets \$1.85 a week for an allowance. He always gets 16 coins. The coins are always nickels, dimes, and quarters. How many of each type of coin does he receive?



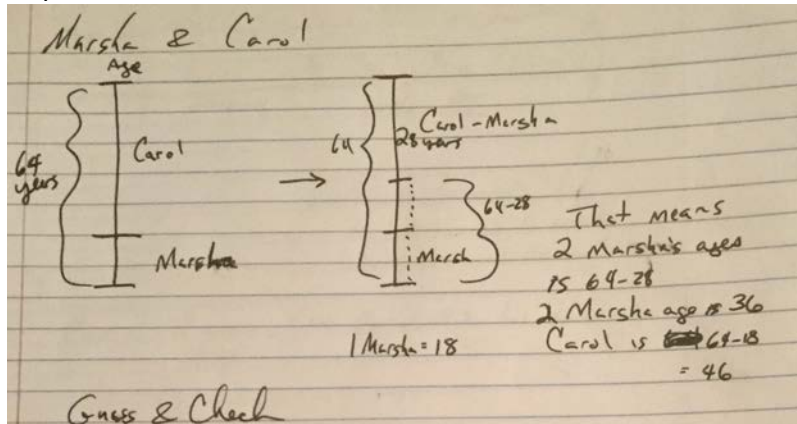
PARKING TICKET PROBLEM

People who are illegally parked in downtown Orlando may be issued \$15 or \$20 parking tickets. At the end of the week, Officer Bob had issued 41 parking tickets that totaled \$655 in fines. How many \$15 tickets and how many \$20 tickets did Officer Bob write?

Bill	Bill	Total fine	Total tickets
20	15	655	41
20	21	705	X
40	1	805	X
30	11	655	

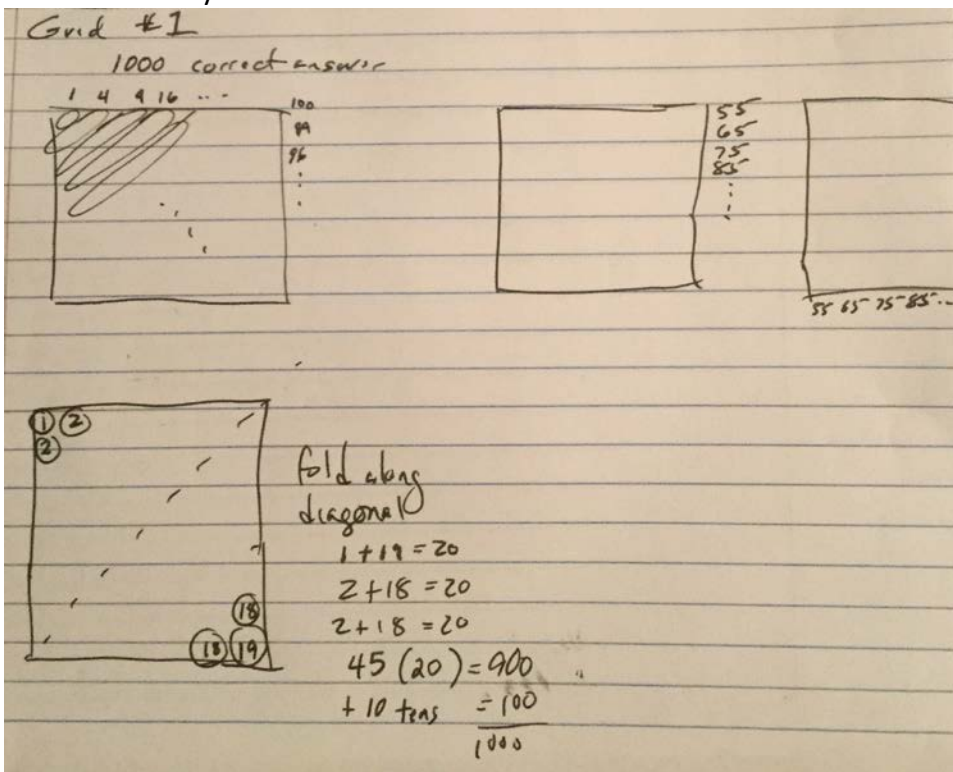
MARSHA & CAROL'S AGE

The sum of Carol and her daughter Marsha's age is 64. The difference in their ages is 28. How old is each person?



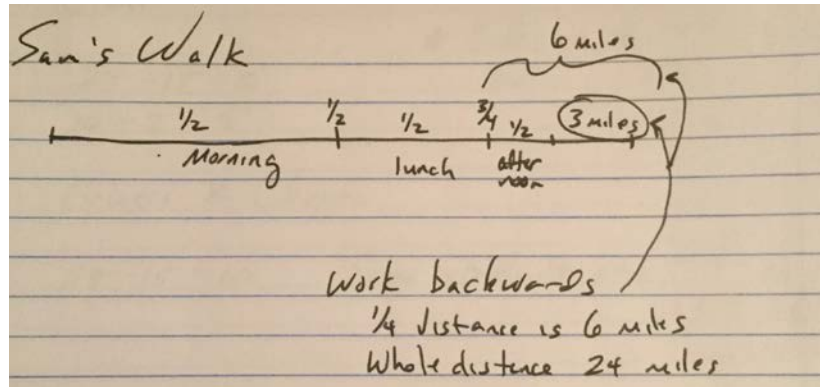
WHAT'S THE SUM PROBLEM (FIRST GRID)

What is the sum of all the numbers in the table? Try to do it without adding each of the numbers one by one.



SAM'S WALK PROBLEM

Sam took a long on his treadmill. He walked half of the total distance in the morning. After lunch, he walked $\frac{1}{2}$ of the remaining distance. In late afternoon he walked half the distance that was left. After dinner he walked the last 3 miles. How far did Sam walk altogether?



WHAT'S THE SUM PROBLEM (SECOND GRID)

What is the sum of all the numbers in the table? Try to do it without adding each of the numbers one by one.

Correct Answer (see Grid #1 for variety)
1400

CIDER PROBLEM

A bottle and cider together cost 25¢. The cider alone costs 15¢ more than what the bottle costs. How much does the bottle alone cost?

Cider

$25 - 15 = 10$

$10 \div 2 = 5$

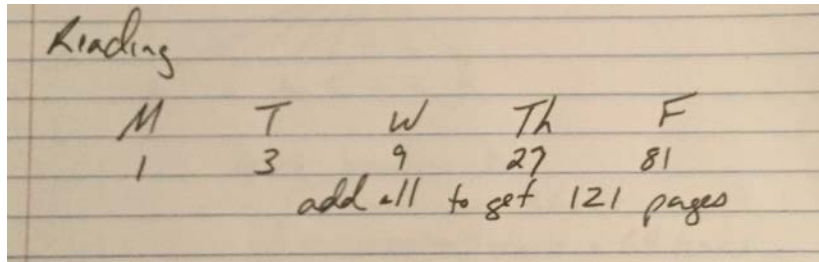
Cider + Bottle = 25¢
20¢ 5¢

Guess & Check

$25 - 15 = 10$ Some students say 10¢ for bottle
15¢ for cider
incorrect

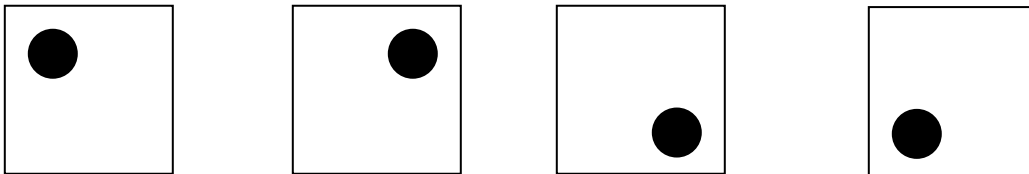
READING ASSIGNMENT PROBLEM

Ann's teacher assigned one page of reading for Monday night. On each of the following days for the rest of the week, he assigned three times as many pages as on the previous night. At the end of the week, all of the pages of the book had been assigned. How many pages were in the book?

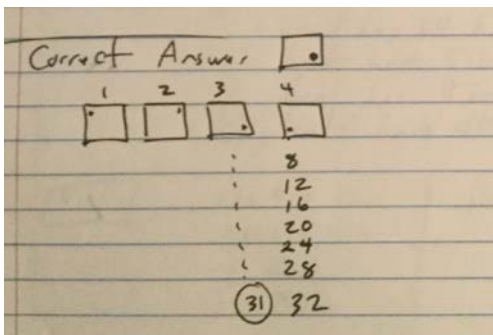


DOTS PROBLEM

Draw five more figures that could reasonably follow in the sequence below. Describe your pattern.



Without drawing any more figures, determine how figure 31 should be drawn.



Ghouls Problem

8 ghouls each had 8 hands. Each hand had 8 warts and each wart had 8 hairs. How many hairs were there?

The diagram shows a hierarchical tree structure representing the relationship between ghouls, hands, warts, and hairs. At the top level, there are 8 circles representing ghouls, with the word "Ghoul" written to the right. Lines connect one of these circles to 8 "H" labels representing hands. From one "H" label, lines connect to 8 "W" labels representing warts. From one "W" label, lines connect to 8 "h" labels representing hairs. Below the diagram, the text "Work backwards" is written, followed by a list of calculations:

Work backwards
1 wart has 8 hairs
~~8 warts~~ 8 warts = 64 hairs
1 hand has 64 hairs
8 hands have 512 hairs
1 ghoul has 8 hands
8 ghouls have 4096 hairs

Pier Problem

Eric and Brian go fishing off the pier. Together they catch 17 small fish. Brian catches 5 more than Eric. How many do they each catch?

The handwritten solution shows the following steps:

Pier $17 - 5 = 12$
 $12 \div 2 = 6$
6 Eric
11 Brian

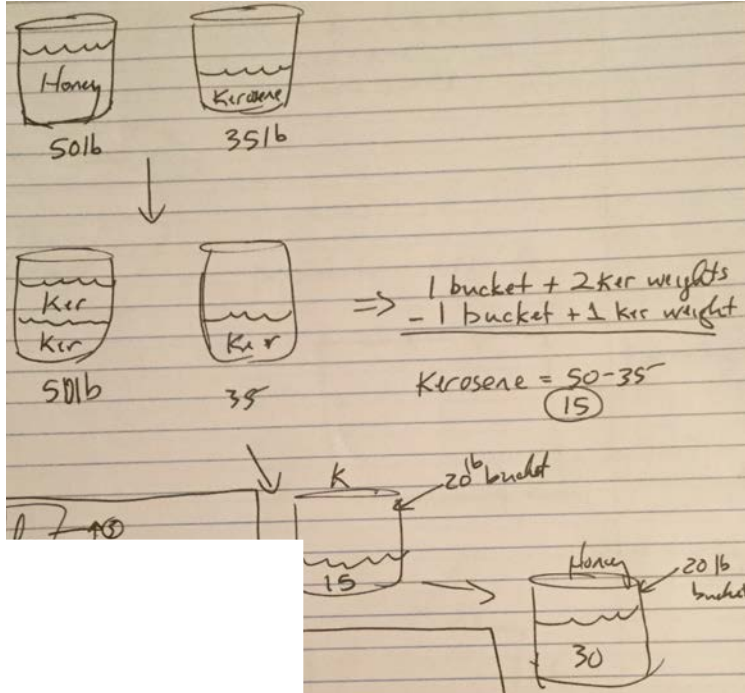
Horseshoe Problem

Eight people sign up for a horseshoe tournament. Each one must play every other contestant at least once. What is the least number of games that could be played?

Horseshoes
(See Handshake)
Correct Answer 28

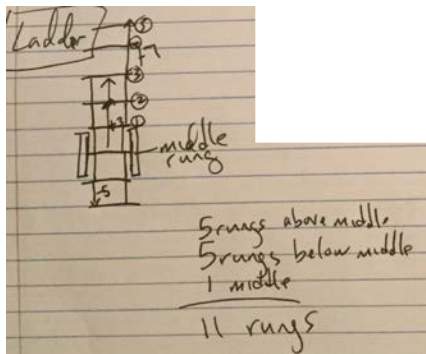
HONEY AND KEROSENE PROBLEM

A bucket of honey weighs 50 pounds. The same bucket with kerosene in it weighs 35 pounds. If honey is twice as heavy as kerosene, how much does the empty bucket weigh?



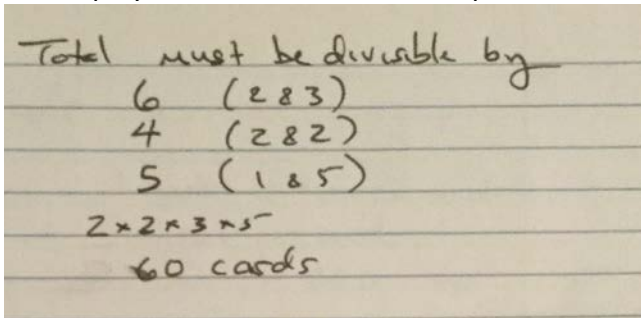
LADDER PROBLEM

A fireman stood on the middle rung of a ladder directing water into a burning building. As the smoke lessened, he stepped up three rungs and continued his work from that point. A sudden flare-up forced him to go down five rungs. Later he climbed up seven rungs to the top of the ladder and entered the building. How many rungs does the ladder have?



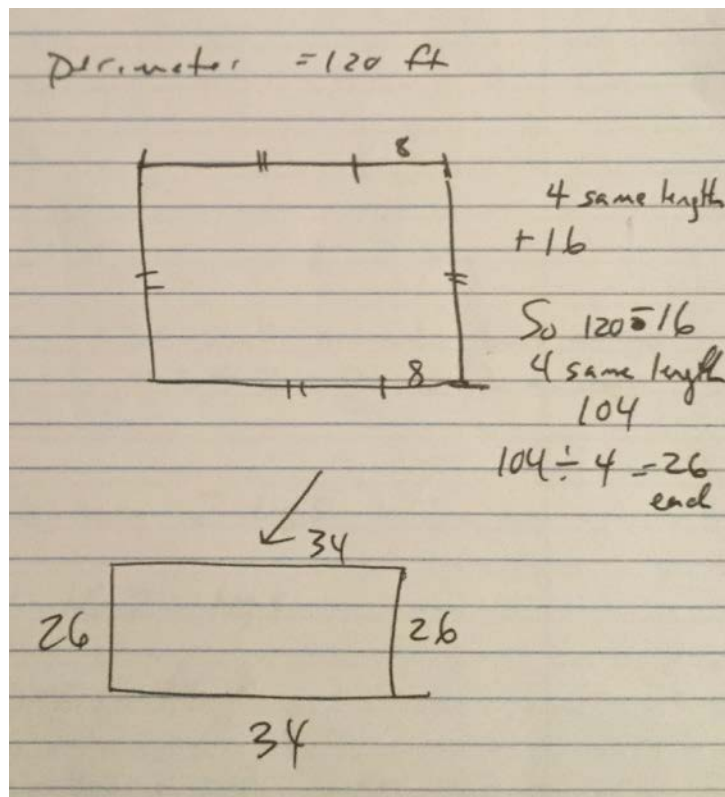
CARD GAME PROBLEM

A card game for 2-6 players has a deck of cards that can always be divided evenly among all the players. What is the smallest possible number of cards that can be in the deck?



Pumpkin Patch Problem

The perimeter of a pumpkin patch is 120 feet. If the length is 8 feet more than the width, what are the dimensions of the pumpkin patch?



An Apple a Day Problem

The Green family believes the old saying, "An apple a day keeps the doctor away." The 5 members of the Green family each eat an apple at least 5 times a week. How many apples do they eat in a year?

Apple

5 people

1 person = 1 apple 5 times in a week
1 person = 5 apples per week
1 person = $5 \times 52 = 260$ apples a year
52 weeks = 1 year

5 people \times 260 apples per year
= 1300 apples per year

other interpretations possible

COWS AND CHICKENS PROBLEM

A farmer was asked how many cows and chickens she has. The farmer replied, "Between the cows and the chickens, there are 162 eyes and 270 feet. How many cows does she have? How many chickens does she have? (NOTE: Chickens have 2 feet and cows have 4 feet.)"

162 eyes
270 feet

Since all animals have 2 eyes
 $162 \div 2 = \underline{81}$ total animals

Assume all animals have 2 legs

$81 \times 2 = 162$ legs

270 total legs though!

Means $270 - 162 = 108$ extra legs to be put on cows 2 at a time
 $108 \div 2 = 54$

(54) cows & $81 - 54$ (27) chickens